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AN ANALYSIS OF THE RELATIONSHIP BETWEEN CONVENTIONAL READING READINESS MEASURES AND INTELLECTUAL FUNCTIONING.

BY- OLSON, NORINNE HILCHEY

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DESCRIPTORS- *READING READINESS TESTS, *GROUP INTELLIGENCE TESTS, *GRADE 1, *READING RESEARCH, FACTOR ANALYSIS, MEASUREMENT INSTRUMENTS, READING TESTS, TESTING,

THE EXTENT TO WHICH READING READINESS TESTS RELATE TO A GROUP OF INTELLIGENCE TESTS WAS INVESTIGATED. APPROXIMATELY 300 FIRST GRADERS IN 15 CLASSROOMS IN GEORGIA WERE ADMINISTERED THE METROPOLITAN READINESS TEST, THE LEE CLARK READINESS TEST, AND THE CALIFORNIA TEST OF MENTAL MATURITY. FACTOR ANALYSIS WAS USED TO ANALYZE THE DATA. THE SUBTESTS OF THE READINESS TESTS DID NOT MEASURE SEPARATE FACTORS OF ABILITY FOR PERFORMANCE. A HIGH DEGREE OF OVERLAP EXISTED IN SUBTEST MEASUREMENTS. THE ONE GENERAL FACTOR PATTERN WHICH EMERGED FROM THE FACTOR ANALYSIS APPEARED TO INDICATE THAT THE VARIANCE OF THE RESPECTIVE SUBTESTS OCCUPIED A SMALLER COMMON SPACE. A SIGNIFICANT DEGREE OF PREDICTIVE RELATIONSHIP WAS FOUND BETWEEN READING READINESS TEST SCORES AND INTELLIGENCE TEST SCORES. ALTHOUGH NOT CONSIDERED IN THE HYPOTHESES, AGE WAS NOT A SIGNIFICANT CONTRIBUTING FACTOR TO THE PREDICTION SCHEME WHEN INTELLIGENCE WAS THE CRITERION VARIABLE. THE SEX FACTOR WAS NOT A SIGNIFICANT VARIABLE. THE PREDICTIVE POWER FOR INTELLIGENCE OF THE READING READINESS TESTS ALONE WAS NEARLY EQUAL TO THE PREDICTIVE POWER OF THE READING READINESS TESTS IN COMBINATION WITH AGE, SEX, AND AGE PLUS SEX. (AUTHOR/BK)

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AN ANALYSIS OF THE RELATIONSHIP BETWEEN CONVENTIONAL READING READINESS MEASURES AND INTELLECTUAL FUNCTIONING

Norinne Hilchey Olson, Evaluator
Ninth District Educational Services Center
Cleveland, Georgia

The purpose of this study was to investigate the extent to which commonly used reading readiness tests are related to intelligence as measured by a reliable standardized group intelligence test. The study was concerned with the following problems:

1. To identify the similarities and/or differences among the subtests of commonly used standardized reading readiness tests.

2. To determine the relationship, if any, between specific reading readiness abilities and specific mental abilities designated by the intelligence test, and to determine the effects of sex as a variable contributing to performance on these measures.

The significance of the study was determined to be in the area of statistical analyses employed. The primary statistical emphasis in previous studies of these areas has dealt with the presentation of the simple correlations between measures of reading readiness and intelligence. A survey of related literature failed to uncover any factor analytic or multivariate analyses of the relationship under investigation.

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The following hypotheses were formulated and investigated by statistical analysis of the data collected:

1. Commonality exists between reading readiness subtests such that the subtests of two commonly used reading readiness tests do not measure separate abilities.

2. A. Reading readiness test scores are not independent of intelligence test scores, such that a significant proportion of the variance of intelligence test scores can be predicted from reading readiness test scores.

B. In the establishment of the prediction scheme, the sex of the respondent will be a differential predictor.

The subjects included in the population of this study were 294 children (N_m=155, N_f=139) enrolled in fifteen first grade classrooms of two rural area school systems in northeastern Georgia.

The subjects averaged 75.90 months of age (or 6.3 years), with a standard deviation of 5.03 months. The total age range was 68 months to 107 months.

The mean total intelligence quotient was 101, with a language intelligence quotient mean of 99 and a non-language intelligence quotient mean of 103.

In September and October of 1966, all subjects were tested using three measures. The six subtests of the Metropolitan Readiness Test (MRT) and three subtests of the Lee-Clark Reading Readiness Test (LCRRT) were used for the collection of readiness test data. The California Test of Mental Maturity (Level O) was used for the group intelligence test. These three measures were

selected due to their widespread use to retain the practicability and generalizability of the results of the study.

In order to examine the hypothesis that the subtest scores of commonly used reading readiness tests represent overlapping measurements to the extent that their respective variances can be represented by a smaller set of common factors, the subtest scores obtained from the administration of the two reading readiness measures were factor analyzed. The schema of the BMD 03M computer program was used to execute the analysis and all analyses were performed on an IBM 7094 computer at the University of Georgia Computer Center.

The intercorrelations among the nine variables were computed and the intercorrelation (R) matrix subjected to a principal axis solution. Unities were employed throughout the principal diagonal of the R matrix and factors with corresponding eigenvalues greater than one were preserved for rotation. The resulting factors were then rotated to the normal varimax criterion.

From the results of this analysis, it appeared that the nine reading readiness subtests contributed to one general common factor. Each variable contributed to this factor with loadings ranging from .54 to .83. The eigenvalue associated with this factor was 4.29 with the indication that almost half (48 per cent) of the total variance of the nine variables was accounted for in this one factor.

Singular high loadings appeared on Factors II, III, IV, and VI, but the corresponding eigenvalues were less than one. These factors were regarded as relatively unimportant factors involved in the independent contribution of a single variable.

With regard to the stated hypothesis, it appeared from these results that a degree of commonality existed between reading readiness subtests. If separate and distinct areas of ability and performance were being measured, the factor pattern would not have shown such a large general factor. The pattern would have been expected to show more than one common factor representing major contributions from variables presumed to measure different and independent aspects of reading readiness.

The second hypothesis stated that commonality exists between abilities measured by reading readiness tests and intelligence tests, such that a significant portion of the variance associated with intelligence test scores can be predicted from reading readiness test scores and that the sex of the respondent will be a differential predictor.

To test this hypothesis, a multiple linear regression analysis was performed. A multiple regression model was employed to determine the amount of variance in the criterion variable that was attributed to the influence of the independent variables collectively and to determine the amount of variance explained by specific independent variables or combinations of independent variables.

To accomplish this end, a multiple correlation coefficient ($\underline{R}$) was computed for the full model (all independent variables included) and for each subsequent restricted model (combinations of independent variables contained in the full model). When each independent variable was deleted from the full model, $\underline{R}^2$'s were

computed. The decrease between the $\underline{R}^2$'s of each restricted model from the $\underline{R}^2$ of the full model was determined.

The full models were established in line with the following statistical notation:

$$Y_i' = BX_1 + BX_2 + BX_3 + BX_4 + k$$

where Y_i referred to a specific intelligence criterion variable and X_1-X_4 referred to the four independent variables of age, sex, MRT, and LCRRT.

The subsequent restricted models associated with each full model were based on the following:

$$Y_i = BX_2 + BX_3 + BX_4 + k$$

where X_1 was omitted:

$$Y_i = BX_1 + BX_3 + BX_4 + k$$

where X_2 was omitted; and

$$Y_i = BX_3 + BX_4 + k$$

where X_1 and X_2 were omitted.

The interpretation of a specific $\underline{R}^2$ was in terms of a coefficient of multiple determination, or the proportion of variance of Y_i (criterion variable) that was dependent upon, associated with, or predicted by X_1, X_2, X_3,..., X_i.

To test the significance of the difference between multiple $\underline{R}$'s an F test was applied. An $\underline{F}$ value was determined for the significance of the decrease in $\underline{R}^2$ for each restricted model and

the significance of this value was determined from the appropriate table. A significant F value would indicate that the variable deleted from the full model contributed significantly to the predictable proportion of variance of the criterion (dependent) variable from the combination of predictor (independent) variables.

Three criterion variables were used in the establishment of three separate full models. These were language I.Q. score, non-language I.Q. score, and total I.Q. score. The predictor variables were Metropolitan Readiness total test score, Lee-Clark Readiness total test score, age, and sex.

Where language intelligence score was the criterion variable, 38.44 per cent of the full proportion of variance was accounted for by the combination of all independent variables. F values for the decreases when age and sex were deleted from the full model were not significant.

All F values computed for the significance of R^2 for each full and restricted model were significant at the .01 level.

When models were established using the non-language intelligence score as the criterion variable, the multiple coefficient (R) indicated that 31.33 per cent of the variance of the criterion variable was predicated on the contributions of all independent variables in the full model. F values for the significance of the R^2 decrease were not significant. As in the first multiple linear regression analysis, the F values for the significance of the full and restricted model R^2's were significant at the .01 level.

The final full model employed total intelligence score as the

criterion variable. When all four independent variables (age, sex, MRT, and LCRRT) were entered into the full model, 46.45 per cent of the proportion of variance for the criterion was predicted.

F values computed for the significance of the decrease from the R^2 of each restricted model to the R^2 of the full model were not significant. As in the case of the other multiple linear regression analyses (language and non-language), age and sex did not appear as significant variables contributing to the proportion of predictive power of the combinations of independent variables.

The F values for the significance of the proportion of variance when total intelligence test score was the criterion variable were significant at the .01 level.

It appeared from the three separate analyses that a significant proportion of the variance of language, non-language, and total intelligence test scores was predicted from reading readiness test scores.

In testable form, the second hypothesis was stated in two parts:

2(a) It is hypothesized that reading readiness test scores are independent of intelligence test scores; and

2(b) the sex of the respondent will not be a differential predictor.

The F values obtained from the multiple linear regression analyses were all significant at the .01 level and section 2(a) of this hypothesis was rejected.

Computations of F values for the significance of decrease in R^2's between full and restricted models were employed to test the 2(b) section of the second hypothesis. None of the F values were

significant, particularly with respect to the decrease when sex was deleted as a contributing independent variable. Therefore, portion 2(b) of the second hypothesis cannot be rejected.

The data analyzed yielded information from which the following conclusions were drawn:

1. The subtests of the reading readiness tests employed in this study did not measure separate and distinct factors of ability and performance.

2. The intercorrelations between the nine reading readiness subtests indicated that a high degree of overlap existed in subtest measurements.

3. The one general factor pattern which emerged from the factor analysis appeared to indicate that the variance of the respective subtests occupied a smaller common space, i.e., the abilities measured could have been determined by the administration of fewer instruments.

4. A significant degree of predictive relationship was found between reading readiness test scores and intelligence test scores. All contributions of variables showed predictive power at the .01 level.

5. Although not considered in the generation of hypotheses for this study, age was not a significant contributing factor to the prediction scheme when intelligence was the criterion variable.

6. The sex factor, as a variable contributing to the prediction scheme, was not a significant variable.

7. The predictive power for intelligence of the reading readiness tests alone was nearly equal to the predictive power of

the reading readiness tests in combination with age, sex, and age + sex.

It appeared from these conclusions and the results of the study that the following educational implications could be considered:

1. The data obtained from the administration of the two selected reading readiness tests appeared to indicate that administration of more than one of this type of test would yield little pertinent additional information about the child's potential.

2. Although previous univariate analyses have indicated differences in readiness performance between sexes, this multivariate analysis indicated no significant difference between boys and girls on readiness performance where intelligence was the criterion variable. It may be that previous research reports indicating differences between sexes were predicted on the assumption that these differences actually existed. Post-test data obtained might therefore be contaminated by teacher treatment and teaching methods based on this assumption of differences.

3. It is this investigator's opinion, based on the results of this study, that test constructors have not yet reached the optimum combination of tests for assessing the reading potential of first grade children.

4. From the results of the regression analyses, it appears that the administration of both types of tests (readiness and intelligence) is valuable since the data indicated that each contributes a significant degree of information not yielded by the other.

Finally, as a result of the findings, the investigator

proposed the following recommendations:

1. Consideration should be given to similar investigations of readiness tests to determine the most efficient composite of predictor tests which measure separate abilities.

2. Research should be encouraged dealing with a closer look at teacher (subjective) evaluations of pupils' readiness, based on the interaction of teacher and pupil and the reliability of the teacher observation.

3. Experimentation with predictor schemes utilizing subtest scores would be of value. Specifically, it could be recommended that reading readiness test scores be used as the criterion variables and intelligence subtest scores be used as independent variables in the prediction scheme. This recommendation is based upon the information that intelligence subtest scores generally yield lower intercorrelations and the predictive power of a multiple regression analysis would be presumed to be higher where low intertest correlations are present.

4. Experimentation is encouraged with a different population, using the same models employed in this study, to ascertain if the results of the factor analysis or predictive significance of the multiple regression would be significantly different.